Scottish & Southern Electricity Networks

RIIO ED2 Engineering Justification Paper (EJP)

Achiltibuie Primary Substation

Worst Served Customer Proposal

Investment Reference No: 398_SHEPD_REGIONAL_WSC_ACHILTIBUIE

Contents

Definitions and Abbreviations

Acronym	Definition
EJP	Engineering Justification Paper
CBA	Cost Benefit Analysis
IDP	Investment Decision Pack
WSC	Worst Served Customer
NoSR	North of Scotland Resilience
SSEN	Scottish and Southern Electricity Network
NRN	Network Reference Number
EHV	Extra High Voltage (33kV)
CBRM	Condition Based Risk Management
MDG	Mobile Diesel Generator
HV	High Voltage
PM	Pole Mounted
CB	Circuit Breaker

1 Executive Summary

This Engineering Justification Paper (EJP) covers the strategic investment required to address the high volume of interruptions on the Achiltibuie network which serves the North West of Scotland area. Achiltibuie primary supplies 285 customers of which 145 are WSCs, which are all located on the Achiltibuie 505-012 11kV circuit. Customers on the Achiltibuie 012 circuit have experienced up to 19 interruptions over the three consecutive years between 2017 and 2019 with average interruption length of up to two hours.

Following optioneering and detailed analysis, as set out in this EJP, the proposed scope of works to address the WSC issue at Achiltibuie are as follows:

- Build a new 6km of 11kV covered conductor OHL circuit from Pole 2 to Pole 84 of the Aciltibuie 505-012 circuit and install 2 new PMCBs;

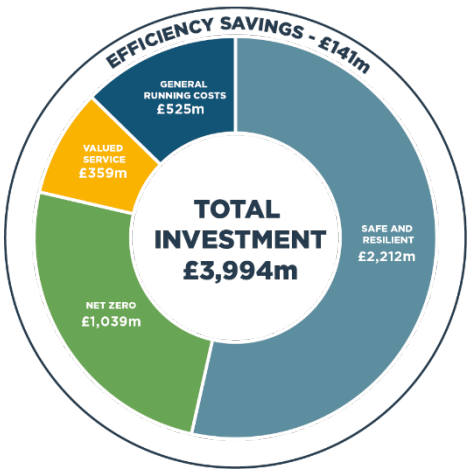
Delivering a safe, resilient and responsive network

The anticipated cost to deliver the proposed solution is £0.44m. The North West of Scotland area is relatively remote area of Scotland and on average access to this area takes a significant amount of time which results in longer fault interruption lengths. Due to other WSC schemes having higher network investment priority scores, this scheme is planned for delivery in Year 5 of ED2 period with the refinement phase commencing in the mid years of ED2.

The scheme delivers following outputs and benefits:

- Improved network performance for the 145 WSCs on the Achiltibuie 012 circuit by installing a new 11kV OHL section create a new 11kV ring and split the existing 11kV network; this is expected to take all 145 WSC out of this classification;
- Improved CI/CML performance as a result of the works with expected volume reductions of 146 CI and 8804 CMLs in the SHEPD area per year;
- Improves the fault resilience of the Achiltibuie 505-012 customers when 11kV faults do occur by providing potential remote control fault resilience options and alternative network arrangements.

This Non-Load investment sits within the Safe and Resilient Totex.



2 Investment Summary Table

Table 1 below provides a high level summary of the key information relevant to this Engineering Justification Paper (EJP).

Table 1: Investment Summary

Name of Scheme/Programme	Achiltibuie Substation WSC Proposal					
Primary Investment Driver	North of Scotland Resilience					
Scheme reference/mechanism or category	398_SHEPD_REGIONAL_WSC_ACHILTIBUIE					
Output reference/type	As above					
Cost	Cost for the selected Investment is £0.44m					
Delivery year	2027/28					
Reporting Table	CV15 North of Scotland Resilience (SHEPD)					
Outputs included in RIIO ED1 Business Plan	**No**					
Spend Apportionment (£m)	**2023**	**2024**	**2025**	**2026**	**2027**	**Total**
	0	0	0	0	0.44	**0.44**

3 Introduction

This EJP provides high-level background information for this proposed WSC scheme explaining the data and analysis undertaken, the existing network arrangement, the proposed works and improvements to the network, the expected outcomes from these works and justifications for the proposals within the Paper.

In order to establish the most economic and efficient solution, the EJP provides an exhaustive list of the options considered through the optioneering process. This is based on the background information and fault data analysis detailed in section 4. Each option is described in detail in section 6, with the justification set out for those options which are deemed unviable solutions, and therefore not taken forward to the Option Analysis in section 7.

The Primary Investment Driver described within this EJP is CV15 – North of Scotland Resilience and the proposed investment will improve the Achiltibuie 11kV network. Post improvement works, due to lower numbers of faults impacting the Achiltibuie customers, all customers will be removed from WSC classification. Achiltibuie has consistently featured in the WSC list ED1. In year 2019, 145 customers out of total 285 customers at Achiltibuie are in the WSC category. These customers experienced high volumes of interruptions, with interruptions of up to 19 over the 3-year period. This clearly is not acceptable to both our customers and ourselves.

4 Background Information and Analysis

4.1 Existing Network

Achiltibuie substation is supplied from Grudie Bridge Grid 33kV circuit 526-301. The site is located on the North West coast of Scotland in Assynt district of Sutherland, Highland. The existing 33kV circuit from Grudie Bridge 301 to Achiltibuie is made up of approximately 87km 33kV overhead line circuit via Ullapool which operates as a radial 33kV circuit for 90% of the circuit's length. Lochinver Primary is located at the terminal end point of the 33kV radial circuit an approx. 15km further north of Achiltibuie.

The site has two 11kV circuits, 505 011 and 012, supplying in total 285 customers. Both feeders are radial 11kV circuits, i.e. there is no interconnection available. Circuit 012 has all the 145 WSCs at this site and this is out of the total 147 customers on this feeder.

This 11kV feeder details are summarised in the table below.

Table 2: Achiltibuie WSCs HV Feeder

11kV Circuit	Number of connected customers	Number of PSR customers	Length of OHL (km)	Length of UG cable (km)
505-012	147	26	11.95	0.04

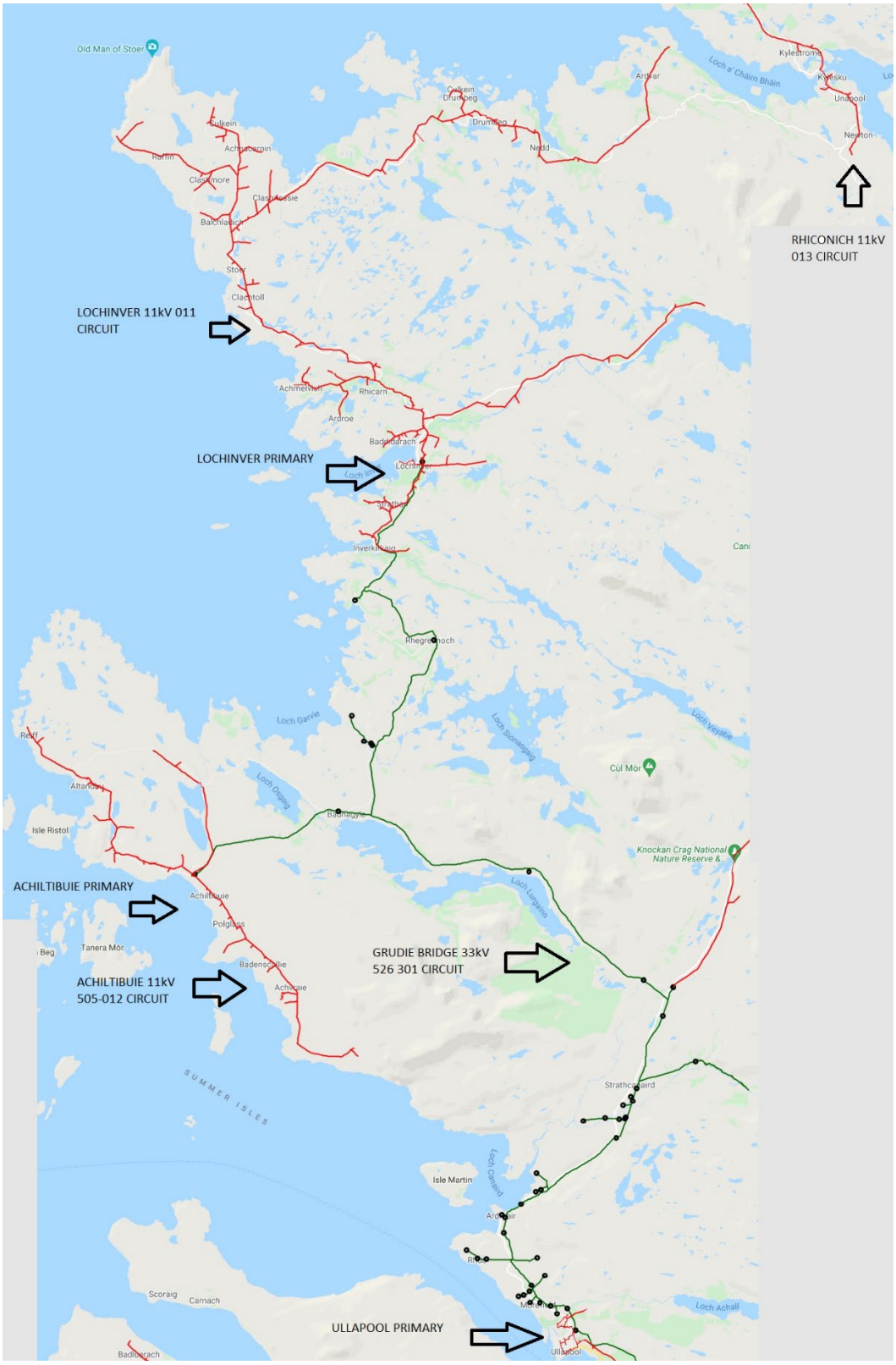


Figure 1: The existing 11kV network of Achiltibuie and sections of the 33kV network supplying Achiltibuie

4.2 WSC Network Performance

At Achiltibuie feeder 012, apart from the first secondary substation where there are two customers, all other downstream 145 WSCs experienced more than 14 interruptions over the 3-year period.

The average interruption length for this circuit is significantly higher than the average SHEPD circuit. This is due to the remoteness of the site and the lack of interconnection. There are two retained ex SSEN staff which are located in Ullapool which is approximately 40 mins drive to Achiltibuie primary substation. Retained staff carry out switching operations only and do not carry out damage repairs. Personnel, vehicles or equipment required to respond to a damage fault or out of typical hours fault are dispatched from Inverness which is approximately 2 hours drive to Achiltibuie primary.

The table below shows the WSC network performance on the 11kV circuit basis (although this also counts 33kV interruptions which impacted the respective 11kV circuit as well). It shows the WSC number and the range of interruptions over the 3-year period from the reporting year 2019/20 against each circuit. As part of the feedback from the stakeholder engagement event, the interruption duration and the customer vulnerability are also considered as key factors in scheme proposal. These are also shown in the table.

Table 3: WSC Network Performance

HV Feeder	WSC No.	Range of interruption No. over 3-year	Average interruption length (mins)	Network Investment Priority score (high score = more vulnerable)
505-012	145	14-19	123	2.9

4.3 Fault Data Analysis

The list below reflects where faults have affected higher customer numbers across the proposed area for investment, there are other lower customer number faults that have occurred during the identified WSC time period which have not been listed.

Table 4: Fault History

Date	Fault Description	No. Customers Impacted
2017	11kV fault: Incorrect Protection Settings, PMCB Mal Op	146
2017	11kV fault: Deterioration, Faulted PMT	145
2017	11kV fault: Deterioration, Broken OHL jumper	47
2018	11kV fault: Transient, PMCB Operation	145
2018	11kV fault: Transient, PMCB Operation on SEF	145
2017	33kV fault: Wind and Gale, Ullapool 33kV 1S0 CB tripped, (all of Achiltibuie customers affected plus further customers connected to 33kV line north of Ullapool)	1353
2017	33kV fault: Lightning, 33kV line PMT near Achiltibuie faulted, (all of Achiltibuie customers affected)	285
2017	33kV fault: Safety Restriction, Removal of mobile generation and restoring to 33kV network, (all of Achiltibuie customers affected)	285
2018	33kV fault: Transient, Grudie Bridge 301 33kV CB tripped, (all customers connected to this 33kV circuit affected)	2653
2018	33kV fault: Incorrect Protection, A fault on generator customer's network caused Grudie Bridge 301 33kV CB trip, (all customers connected to this 33kV circuit affected)	2653
2018	33kV fault: Transient, Grudie Bridge 301 33kV CB tripped, (all customers connected to this 33kV circuit affected)	2661
2019	33kV fault: Lightning, Faulty surge Arrestor, (all of Achiltibuie customers affected plus further customers connected to 33kV line north of Ullapool)	1382
2019	33kV fault: Deterioration, Failure of Air Break Switch, (all of Achiltibuie customers affected plus further customers connected to 33kV line north of Ullapool)	1385

There were in total 8 number 33kV interruptions on Grudie Bridge Grid (526-301) between 2017 and 2019 affecting the supply to Lochinver. 33kV faults on this circuit typically results in supply interruption for all of Achiltibuie customers plus wider customers on the circuit dependent on the fault location.

On the Achiltibuie 11kV 012 circuit, there were five interruptions between 2017 and 2019 that affected a large proportion of the 012 circuit customers. The average restoration time of these interruptions is over 2 hours. This is due to the remoteness of these areas for fault restoration and repair activities. It is the combination of 11kV and 33kV faults which lead to WSC performance on this circuit.

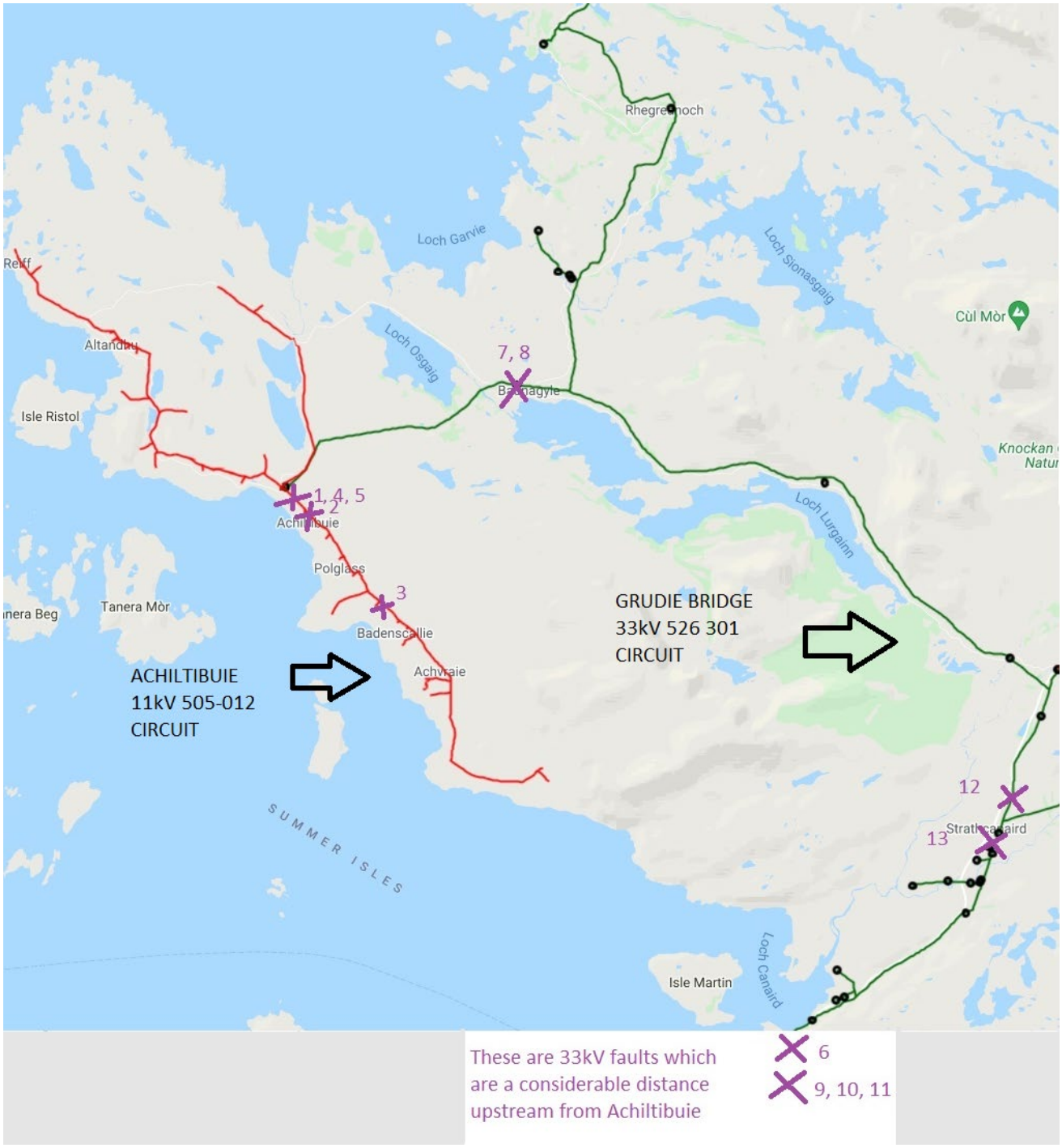


Figure 2: Locations of 11kV and 33kV faults which have affected Achiltibuie customers

5 Optioneering

This section of the report sets out the investment options that are considered when resolving the WSC issues. As described below a holistic approach is taken to ensure investment options which are both least regrets and represents best value for money for network customers are identified.

5.1 Summary of Options

Table below provides a high-level summary of the 5 investment options under consideration along with the advantages and disadvantages associated with each. A more detailed description of each option is then provided within the proceeding sub-sections.

Table 5: Summary of WSC Investment Options

Option	Description	Advantages	Disadvantages	Result
1. Do Nothing (Baseline)	No upfront action taken to improve the network performance. Maintenance and Inspection activities continue as normal.	No additional cost	WSCs will continue experiencing high number of interruptions.	Rejected
2. Enhanced Maintenance and/or Inspection (Refurbishment)	Enhanced inspection and maintenance to improve asset condition or slow the rate of ageing.	Cost effective over short time period No large upfront CAPEX	Additional maintenance resource required Significant proportion of customers remain as WSCs Increase in OPEX	Taken forward to further assessment.
3. Re-build existing lines (Replacement)	Rebuilding the existing network where the WSCs are to reduce the probability of failure on components.	Improve the network performance over short term No further maintenance or inspection required	Increase in CAPEX Lower utilisation of existing assets WSCs will fall back in this category over short period of time. No new fault resilience added	Taken forward to further assessment.
4. Reinforcing existing network (Reinforcement)	Installation of additional assets to mitigate the risk of interruptions due to single circuit supply arrangement	WSCs unlikely to return to this category as new fault resilience added Long term investment Wider benefits to network users including Net Zero targets	Often costly when compared with other options Longer delivery time due to the likely requirement of additional consent	Taken forward to further assessment/preferred option.
5. Flexible solutions	Use battery storage or other alternative mean to support the network and mitigate interruptions	Reduced requirement of reinforcing the network	Technology and mechanism is yet to be proven Limited sites that can utilise such	Option rejected.

		Competitive cost comparing to the reinforcement option	arrangement to improve WSC performance	

6 Analysis and Cost

6.1 Option 1: Do Nothing

Estimated Cost: £0k

This group of customers are supplied by remote 11kV network which has consistently demonstrated that its performance is within WSC classification. Without any intervention, the WSCs will experience similar or higher level of 11kV interruptions into ED2 and beyond. Therefore, this option is not considered viable.

6.2 Option 2: Enhanced Maintenance and/or Inspection (Refurbishment)

Estimated Cost: £18k

This option is to carry out enhanced maintenance on the Achiltibuie 012 11kV circuit. This will target the assets with poor health condition and the worst performing sections with targeted measures such as pole replacement and refurbishment. This is likely to improve the network performance for a small portion of the WSCs. However, given that are a number of faults are due to external factors, such as wind and gale, birds and transient events, then this option will not resolve these potential faults. It is likely that significant number of customers would remain as WSCs as no fault resilience is added to the circuit in the form of circuit interconnection or splitting the circuit.

Due to the lack of significant network improvement, the Brae customers could experience WSC equivalent performance during the full ED2 period. Taking account of the anticipated post works deterioration in network performance, the likely outcome is that the Option 2 refurbishment in ED2 would have to be followed by the Option 4 reinforcement in ED3.

6.3 Option 3: Re-build existing lines (Replacement)

Estimated Cost: £534k

Under this option, it is considered that the entire Achiltibuie 505-012 circuit is re-built approximately [redacted] of 11kV overhead line.

As a result of the proposed works, it is expected that the network performance will result in reasonable improvements however the network performance would deteriorate over time for the Achiltibuie circuit. It is likely that significant number of customers would remain as WSCs as no fault resilience is added to the circuit in the form of circuit interconnection or splitting the circuit and so the Achiltibuie 012 circuit would remain exposed to faults arising from external factors.

During the proposed Option 3 works, it is likely that the proposals would be built as an ‘online’ build which requires circuit outages that would impact the respective WSC and potentially wider area customers. Also, it would lead to an increase in diesel usage and CO_2 emissions due to usage of mobile generation to ensure customers were not off supply for excessive periods of time during the works.

It is assumed that 20 years post carrying out the Option 3 works, due to deteriorating performance of the circuit, that the Option 4 reinforcement proposal would have to be implemented at that point in the future.

6.4 Option 4: Reinforcing existing network (Reinforcement)

Estimated Cost: £444k

It is proposed for Achiltibuie 012 to install a new 6km covered conductor 11kV OHL between pole 2 and pole 84 to create a ringed 11kV circuit with the existing circuit as shown on the drawing below. Also installed are

two new PMCBs with remote control facilities and creation of a new normally open point (NOP). This would enable the 11kV radial circuit to be split this into 2 separate sections as part of normal network operation.

The proposed option will help reduce the number of individual 11kV faults on the Achiltibuie 012 circuit which impacts all customers on the spur as it splits the network into 2 different 11kV sections, this will limit the impact of any 11kV fault in any one section. This therefore reduces the total number of faults experienced per year by the customers and provides new options for backfeed arrangements, including possible remote-control recovery options.

During the proposed Option 4 works, as the proposal is to build new infrastructure, the majority of new equipment can be constructed as 'offline' build. This would minimise the requirement for circuit outages that would impact the respective WSC and potentially wider area customers. As there would be less requirement for outages, this would result in lower amounts of diesel usage and CO_2 emissions due to usage of mobile generation as compared to Option 3.

Although a relatively high number of 33kV faults have affected Achiltibuie primary and associated customers, due to the value of the required investment to mitigate these 33kV faults it is not seen as economically justifiable to pursue a 33kV solution. As the proposed works on the 11kV are seen as likely to remove the customers from WSC classification then an 11kV solution is deemed sufficient in terms of required investment. Therefore, taking account of these factors, this is the preferred option.

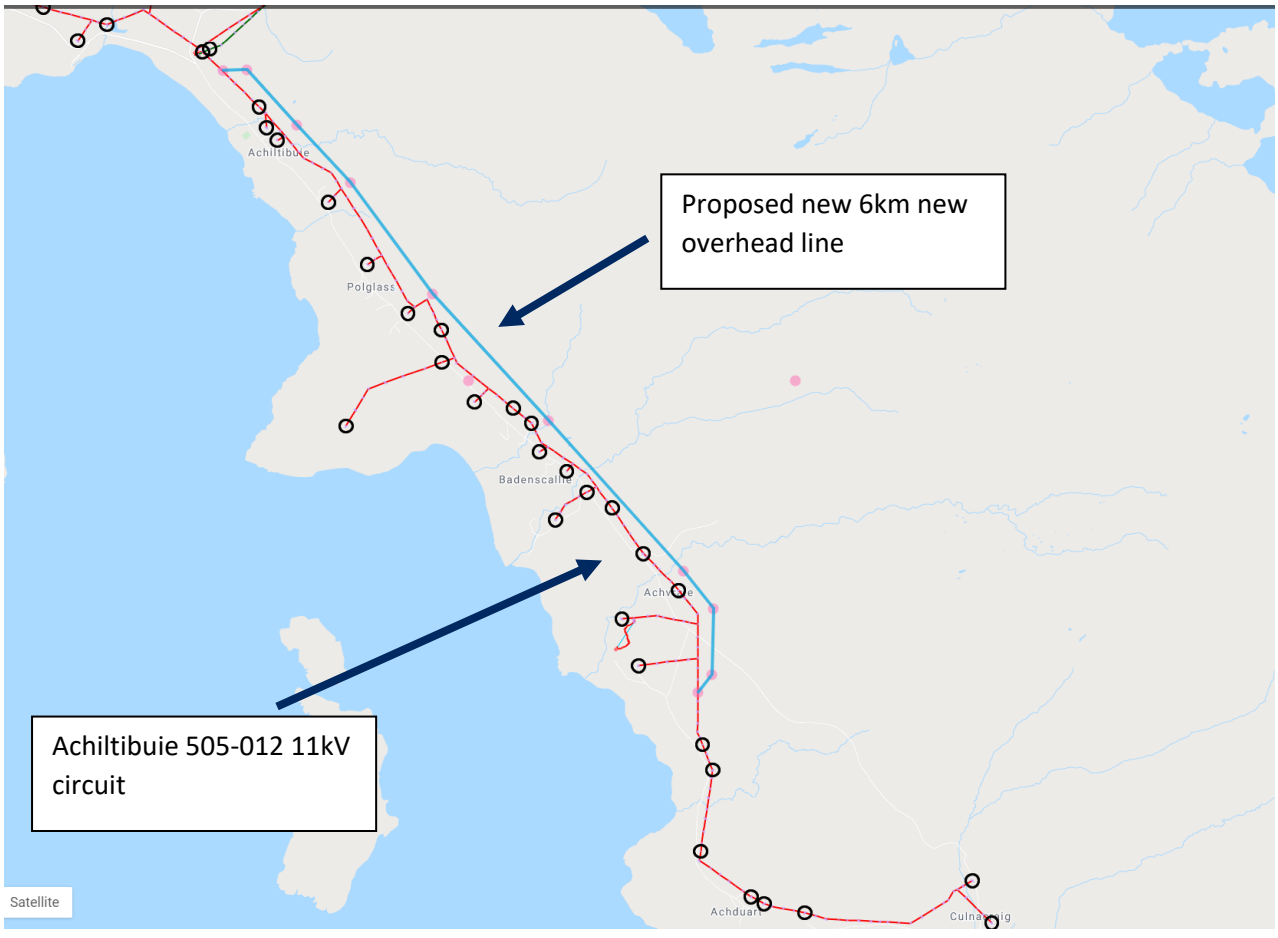


Figure 3: Proposed works for Option 4

It should be noted that although there will be no immediate improvements to 33kV network performance, the delivery of the proposed Option 4 works in the Lochinver WSC EJP contains elements of a North West of Scotland Resilience plan. In future years, post the ED2 period, the delivery of the 2nd stage of the proposed plan, will result in significant 33kV network performance improvements across the North West of Scotland and benefit a range of primary substations including Achiltibuie. This will significantly enhance network resilience across the region to the material benefit of the customers in that region.

Therefore, taking account of these factors, this is the preferred option.

6.5 Option 5: Flexible Solution

Estimated Cost: £45k

Flexibility services could be used to support some of the remote substations in the 11kV fault scenario. The flexible solution needs to be made available throughout the year and be able to support the network over the period to allow the restoration. This period can be up to 2 hours based on the fault history.

The estimated cost is based on the energy storage service to support 0.5MW load on this feeder with maximum utilisation of 30 days per annum starting from the final year in ED2. The details costing is attached in appendix 4. The technology is still unproven for a solution that can support the network of this size for this duration. Due to the nature of the 11kV faults and the network, there will also be the challenge in identifying the best location for this service in the network. Under this option, it is unlikely to improve the performance for all WSCs. Therefore, this option is not considered viable.

7 Option Analysis

This section of the report provides an overview of the CI/CML results and analysis for each option. It provides an overall comparative review and analysis of the options, confirmation of the EJP preferred option and the associated justifications. The figures presented below represent the expected percentage improvement of the Ofgem CI & CML methodology ratio figures for SHEPD area per year and the expected actual volume reductions of CI and CMLs in the SHEPD area per year.

7.1 CI/CML Analysis of refurbishing the existing line (Option 2)

It is expected that following Customer Interruption (CI) and Customer Minutes Lost (CML) improvements will be achieved under this option. These figures are too low to improve the number of WSC and will make no discernible impact on the quality of supply and network performance. The assumption is that these benefits will diminish over a period of five years, by when the reinforcement option would be necessary to address the WSC issue.

Table 6: CI/CML Improvement for Option 2

	CI Improvement % (Actual Volume)	CML Improvement % (Actual volume)
Achiltibuie (505-012)	0.001 (15)	0.002 (1845)

7.2 CI/CML Analysis of re-building of the existing line (Option 3)

It is expected that the CI & CML improvements for the re-build option would be higher than the refurbishment option but are remain low CI & CML values due to the same network arrangement being retained. The assumption is that these benefits will diminish over a period of twenty years and at this future point the reinforcement option would be necessary to address the WSC issue.

Table 7: CI/CML Improvement for Option 3

	CI Improvement % (Actual Volume)	CML Improvement % (Actual volume)
Achiltibuie (505-012)	0.002 (29)	0.004 (3685)

7.3 CI/CML Analysis of reinforcement of the network (Option 4)

The expected CI and CML improvements based on this option is as shown in the table below. The table shows a significant improvement for CI/CML and network performance relative to the customer numbers involved and this will remove all Brae customers from WSC classification.

Table 8: CI/CML Improvement for Option 4

	CI Improvement % (Actual Volume)	CML Improvement % (Actual volume)
Achiltibuie (505-012)	0.0182 (146)	0.011 (8804)

From the above tables, it is evident that the CI/CML improvement from the reinforcement option is significantly higher than the other proposed options. This confirms the case that Option 4 is the most preferable option as it delivers the required level of improvement to the network and will permanently remove those customers from WSC classification.

7.4 Summary of Cost

Table 9: Summary of Cost

Options	Unit	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Option 1 – Do Minimum	£m	0	0	0	0	0	0
Option 2 – Enhanced Maintenance and Inspection	£m	0	0	0	0	0.02	0.02
Option 3 – Asset Replacement	£m	0	0	0	0	0.53	0.53
Option 4 – Reinforcement	£m	0	0	0	0	0.44	0.44
Option 5 – Flexible Solution	£m	0	0	0	0	0.05	0.05

Our RIIO ED2 Business Plan costs are derived from our outturn RIIO ED1 expenditure. We have modified costs per activity, capturing and reporting those adjustments in our cost-book. By tying our costs back to reported, outturn, real life data this approach provides multiple data points on which both the Regulator and we can benchmark cost efficiency.

It provides a high level of cost confidence in our Business Plan cost forecast for RIIO ED2. Through our benchmarking analysis, we recognised that not all Non-Load related RIIO-ED1 actual unit costs sit within the upper quartile efficiency band. Where this is the case, we have applied a catch-up efficiency to those cost categories.

Further detail on our unit cost approach, cost efficiency and cost confidence for RIIO-ED2 can be found within our ***Cost Efficiency (Annex 15.1)***. Following our draft Business Plan, we have continued to develop project volumes and costs, utilising valuable stakeholder feedback. We have included developments of our Commercial Strategy within the updated project scope and delivery strategy.

7.5 Option Analysis comparisons

As outlined in the EJP, due the remoteness of the Achiltibuie primary in the North West of Scotland area, this significantly lengthens the fault interruption duration experienced by the customers because the travel time to reach the area. Therefore, any enhancements which can improve fault resilience of the affected circuit will be of significant benefit.

The tables above demonstrate that the reinforcement option is the preferred option as the other options are either rejected as non-viable, have poorer CI/CML performance or higher investment cost. As Options 2 and 3 do not introduce any new fault resilience to the Achiltibuie circuit; they only deliver marginal/lower improvement in CI/CML and network performance; which will deteriorate in future years and therefore they cannot be chosen as the preferred option.

The preferred option allows the customers to benefit from investment in ED2 and improved CI/CML and network performance. Both Option 2 and Option 3 are envisaged to incorporate the works in Option 4 with reinforcement in the future years to achieve the improved performance delivered by Option 4.

As such, it is understood that delaying the investment does not provide the best value for money solution, reinforcing the case for Option 4.

7.6 Volume on Preferred Option

Table 10: Volume of Preferred Option

Asset Category	Unit	2023/24	2024/25	2025/26	2026/27	2027/28	Total
11kV OHL (Covered Conductor)	Km	0	0	0	0	5.5	5.5
11kV Poles	#	0	0	0	0	79	79
11kV CB (PM)	#	0	0	0	0	3	3
11kV Switch (PM)	#	0	0	0	0	2	2
11kV Pole Refurbishment	#	0	0	0	0	19	19

8 Validate investment plans and benefits with Stakeholders

This section of the EJP describes the stakeholder engagement strategy that has been implemented to inform SSEN's RIIO-ED2 submissions. This includes the engagement activities that have been undertaken, the stakeholder groups that have been approached, and the feedback that has been gathered from this stakeholder engagement.

The intention of this exercise was to identify the appetite from our stakeholders for SSEN in carry out the investment described within this document during RIIO-ED2 to improve the condition of SSEN's network assets and the quality of supply for customers in during ED2 and beyond.

We conducted audience research with stakeholders via online workshops/open forums to co-create our strategies and priorities in RIIO-ED2 for improving the network for WSCs. Following insights were derived:

- Stakeholders suggested that, based on the remote location of some Scottish islands, investment for the WSCs there should be a priority, as it will potentially take far longer to restore power there compared to mainland areas.
- There was no consensus on whether investment in worst-served circuits should be prioritized according to: number of WSCs; number of interruptions; level of customer vulnerability; or potential of low carbon technology (LCT) take-up.
- Stakeholders, however, expressed concern about the impact of power cuts on customers in vulnerable situations, and on this basis focusing investment efforts on reducing the number of worst-served vulnerable customers was supported.
- The interruption duration which is currently not considered in Ofgem's WSC definition is recognized as an important factor by our stakeholders.
- Stakeholders suggested that an annual WSC report would be welcome and raise the profile of the issue but might give the incorrect impression that these are the areas where there will be investment.
- Some stakeholders were concerned about the impact of worst-served circuits on generation as well as supply customers.

The lack of consensus on stakeholders on how to prioritise worst-served areas for improvement clearly suggests that being worst-served is a substantial detriment to all such customers, albeit playing out in different ways and therefore remedying these is extremely important. Therefore, we are committing to remove at least 75% of customers from this list in ED2; this ambitious proportion represents all circuits where cost benefit analysis warrants investment; the remaining 25% of WSCs are distributed over so many circuits that the benefit derived from each circuit investment would be limited to very few customers.

We will also ensure that we communicate effectively during power outages, particularly for remote communities where electricity is heavily relied upon, promote the PSR and the 105 power outage number, and produce an annual WSC report to be shared with wider stakeholders to embed resilience partnerships.

Based on the stakeholder feedback, the average Customer Minutes Lost (CML), Priority Service Register (PSR) and the vulnerability score from the Customer Mapping Tool are also factored in the scheme consideration.

9 Deliverability and Risk

Between our draft and final Business Plans we have carried out a more detailed deliverability assessment of our overall plan as a package and its component investments. Using our draft Business Plan investment and phasing as a baseline we have followed our deliverability assessment methodology. We have assessed any potential delivery constraints to our plan based on:

- In-house workforce capacity and skills constraints based on our planned recruitment and training profile and planned sourcing mix as well as the efficiencies we have built into our Business Plan (detailed in our ***Ensuring Deliverability and a Resilient Workforce (Chapter 16)*** and ***Cost Efficiency (Chapter 15)***
- Assessment of the specific lead and delivery timelines for the asset classes in our planned schemes
- We have evaluated our sourcing mix where there were known delivery constraints to assess opportunities to alleviate any constraints through outsourcing
- We have engaged our supply chain (detailed in our ***Supply Chain (Annex 16.2)***) to explore how the supply chain could support us to efficiently deliver greater volumes of work and how we could implement a range of alternative contracting strategies to deliver this
- We have also engaged with the supply chain on the delivery of work volumes that sit within Uncertainty Mechanisms to ensure we have plans in place to deliver this work if and when the need arises
- We have assessed the synergies between our planned load, non-load and environmental investments to most efficiently plan the scheduling of work and minimise disruption to consumers
- Based on our assessment of delivery constraints and potential solutions to resolve them, we have revised our investment phasing accordingly to ensure our Business Plan is deliverable, meets our consumers' needs and is most cost efficient for our consumers

Scottish National Heritage and Scottish Environment Protection Agency may object to OHL circuits or elements of them and request undergrounding of sections of the OHL proposed routes or impose various conditions related to archaeological or environmental or ecological requirements to carry out the works.

10 Conclusion

The purpose of this Engineering Justification Paper (EJP) has been to describe the overarching investment strategy that SSEN intends to take during RIIO ED2 for the NoSR related investment in Achiltibuie substation.

Five investment options have been described which could be carried out to address the WSC issue at these sites. As detailed within Section 7, a holistic approach is taken when selecting the most viable option for each investment, where the primary and secondary investment drivers are assessed together within the Option Analysis and Assessment section. This includes careful consideration of the financial, safety, and environmental implications of each investment option.

- Option 1: Do Minimum
- Option 2: Enhanced Maintenance and Inspections
- Option 3: Asset Replacement
- Option 4: Asset Reinforcement
- Option 5: Flexible Solution

A thorough stakeholder engagement exercise was undertaken to gather feedback on each of these strategies to determine which approach should be proposed within SSEN's RIIO ED2 business plans.

As a result, the following costs and volumes are proposed for delivery during RIIO ED2. The preferred investment for Achiltibuie substation in RIIO ED2 is Option 4: Reinforcement

Table 11: Summary of CV Table

CV Table	Unit	2023	2024	2025	2026	2027	Total
CV15 North of Scotland Resilience RIIO ED2 Spend	£m	0	0	0	0	0.44	0.44

11 Appendix 1 List of Indicators of Vulnerable Characteristics and Weighting System

These indicators are applied when producing combined indexes of vulnerability.

Indicator of vulnerable characteristic	Network investment priority: score (high score = more vulnerable)
Under 5 years	0.5
Under 16 years	0
Over 65 years	0.1
Over 75 years	0.4
Over 85 years	0.6
Fuel poverty levels (Scotland; 1=low, 4=v.high)	0
Fuel poor households (England)	0
Dwellings without a mains gas connection	0
Dwellings without central heating system	0
Dwellings rated in EPC bands EFG	0
Households with no car	0
Combined distances to services (Score; high=most remote)	0
Children in low income households	1
People with low qualifications	0
People in low income employment	1
Long-term unemployment	1
Disability benefits	1
Child disability benefits	1
Mental health benefits	1
Universal credit claimants	0
People in bad or very bad health	0.5
People whose health condition limits activities a lot	0.5
Access to health services (Score; 0=best access, 100=worst access)	0
People providing over 20hrs/week of care	0.5
Number of residential care homes	0
Number of care home beds	0
Households in privated rented dwellings	1
Lone parents	1
Ethnic minorities	1
Unable to speak English well or at all	0
Lone pensioners	1

12 Appendix 2: Relevant Policy, Standards, and Operational Restrictions

TG-NET-NPL-012.pdf

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13 Appendix 4. Assumptions for Flexible Solutions Costing

Contract Year	Availability Price – CMZ Secure (£/MW/Day)	Capacity offered (MW)	Potential Days Required	Maximum Total Availability price paid	Utilisation Price – CMZ Secure (£/MWh)	Maximum Potential Energy Required (MWh)for 30 days per annum	Total Utilisation Cost (£) per annum	Yearly total
Year 1	[redacted]	0.5	365		[redacted]	360		
Year 2	[redacted]	0.5	365		[redacted]	360		
Year 3	[redacted]	0.5	365		[redacted]	360		
Year 4	[redacted]	0.5	365		[redacted]	360		
Year 4	[redacted]	0.5	365	[redacted]	[redacted]	360	[redacted]	[redacted]